Universe

Jet Propulsion Laboratory

Inside

August 15, 2003
Volume 33 Number 16

SIRTF launch Aug. 23

THE SPACE INFRARED TELESCOPE Facility (SIRTF), the fourth and final element in NASA's family of orbiting "Great Observatories," is undergoing final preparations for its long-anticipated launch, scheduled for Aug. 23 from Cape Canaveral Air Force Station, Florida.

The mission, managed by JPL, will launch at 1:37 a.m. Eastern time, which is 10:37 p.m. Pacific time on Aug. 22.

Deputy Project Manager Bill Irace said recent checkouts have shown the spacecraft and Delta II Heavy launch vehicle to be in good shape. Recently activity includes a successful operations launch readiness test on Aug. 5, followed the next day by the removal of the telescope's dust cover.

The second stage of SIRTF's Delta II rocket is lowered into position atop the first stage.

Batteries have been charged, an electrical checkout was completed, and the spacecraft has been installed on the Delta's second stage. The next scheduled milestone, Irace said, was a flight readiness review scheduled for Aug. 15.

The launch period extends to Sept. 17.

"It's exciting; we're all past ready," Irace said. "The team is really chafing at the bit to get this spacecraft into orbit."

During its 2.5-year mission, SIRTF will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space between wavelengths of 3 and 180 microns (1 micron is one-millionth of a meter). Most of this infrared radiation is blocked by the Earth's atmosphere and cannot be observed from the ground.

Consisting of a 0.85-meter telescope and three cryogenically-cooled science instruments, SIRTF will be the largest infrared telescope ever launched into space. Its highly sensitive instruments will give us a unique view of the universe and allow us to peer into regions of space that are hidden from optical telescopes. Infrared light allows us to peer into regions of star formation, the centers of galaxies, and into newly forming planetary systems.

The other missions in NASA's Great Observatories Program are the Hubble Space Telescope, Compton Gamma-Ray Observatory and the Chandra X-Ray Observatory. SIRTF is also a part of NASA's Astronomical Search for Origins Program, designed to provide information that will help us understand our cosmic roots, and how galaxies, stars and planets develop and form.

All objects in the universe with temperatures above absolute zero (-460 F) emit some infrared radiation, or heat. Infrared wavelengths lie beyond the red portion of the visible spectrum and are invisible to the human eye. Most infrared light emitted by celestial objects is absorbed by Earth's atmosphere. Scientists rely on orbiting telescopes such as SIRTF to capture data on celestial objects and phenomena that are too dim, distant or cool to study using ground-based telescopes or by other astronomical techniques.

For more information about the mission, go to *http://sirtf.caltech.edu*.

Mars Scout mission selected

JPL will manage 'Phoenix' lander, set for 2007 launch

By Guy Webster

IN MAY 2008, THE PROGENY OF TWO PROMISING U.S. missions to Mars will deploy a lander to the water-ice-rich northern polar region, dig with a robotic arm into arctic terrain for clues on the history of water, and search for environments suitable for microbes.

NASA announced Aug. 4 that it has selected the University of Arizona "Phoenix" mission for launch in 2007 as what is hoped will be the first in a new line of smaller competed "Scout" missions in the agency's Mars Exploration Program.

JPL will manage the project and provide mission design. Barry Goldstein *(below)*, currently on the Mars Exploration Rover Project, has been named the Phoenix project manager. Also, JPLers named to the science team are Diana Blaney, Eric de Jong, Michael Hecht and Leslie Tamppari.

The science instruments and operations will be a University of Arizona responsibility. Lockheed Martin Space Systems, Denver, will build and test the spacecraft. Canadian partners will provide the meteorological instrumentation, including an innovative laser-based sensor.

Phoenix has the scientific capability "to change our thinking about the origins of life on other worlds," said Dr. Peter H. Smith of the University of Arizona Lunar and Planetary Laboratory, who heads the Phoenix mission. "Even though the northern plains are thought to be too cold now for water to exist as a liquid, periodic variations in the Martian orbit allow a warmer climate to develop every 50,000 years. During these periods the ice can melt, dormant organisms could come back to life, (if there are indeed any), and evolution can proceed. Our mission will verify whether the northern plains are indeed a last viable habitat on Mars."

The lander for Phoenix was built and was being tested to fly as part of the 2001 Mars Surveyor Program, but the program was canceled after the Mars Polar Lander was lost upon landing near Mars' south pole in December 1999. Since then, the 2001 lander has been stored in a clean room at Lockheed Martin in Denver, managed by NASA's new Mars Exploration Program as a flight asset.

Renamed Phoenix, it will carry improved versions of panoramic cameras and a volatiles-analysis instrument from the ill-fated Mars Polar Lander, as well as experiments that had been built for the 2001 Mars Surveyor Program, including a JPL trench-digging robot arm and a chemistry-microscopy instrument. The science payload also includes a descent imager and a suite of meteorological instruments.

The mission's goals are to study the geologic history of water, the key to unlocking the story of past climate change; and to search for evidence of a habitable zone that may exist in the ice-soil boundary, the "biological paydirt."

The Phoenix robotic arm will scoop up Martian soil samples and deliver them for heating into tiny ovens of the volatiles-analysis instrument so team members can measure how much water vapor and carbon dioxide gas are given off, how much water ice the samples contain, and what minerals are present that may have formed during a wetter, warmer past climate. The instrument, called thermal evolved gas analyzer, will also measure any organic volatiles.

Using another instrument, researchers will examine soil particles as small as 16 microns across. They will measure electrical and thermal conductivity of soil particles using a probe on the robotic arm scoop. One of the most interesting experiments is the wet chemistry laboratory, Smith said.

"We plan to scoop up some soil, put it in a cell, add water, shake it up, and measure the impurities dissolved in the water that have leached out from the soil. This is important, because if the soil ever gets wet, we'll know if microbes could survive," Smith said. "We'll know if the wet soil is super acidic or alkaline and salty, or full of oxidants that can destroy life. We'll test the environment that microbes might have had to live and grow in."

Mars rovers' instruments assessed

The first in-flight checkouts of the science instruments and engineering cameras on JPL's twin Spirit and Opportunity spacecraft on their way to Mars have provided an assessment of the instruments' condition after the stressful vibrations of launch.

The instrument tests run by the Mars Exploration Rover flight team at JPL finished with performance data received Aug. 5 from two of the spectrometers on Opportunity.

Each rover's suite of science instruments includes a stereo panoramic camera pair, a microscope camera and three spectrometers. The tests also evaluated performance of each spacecraft's engineering cameras, which are a stereo navigation camera pair, stereo hazard-avoidance camera pairs on the front and back of the rover, and a downward-pointing descent camera on the lander to aid a system for reducing horizontal motion just before impact.

All 10 cameras on each spacecraft—three science cameras and seven engineering cameras on each—performed well. One of Spirit's three spectrometers returned data that did not fit the expected pattern. Spirit's other two spectrometers and all three on Opportunity worked properly.

"All the engineering cameras are healthy," said JPL imaging scientist Dr. Justin Maki. "Even when the cameras are in the dark, the images give characteristic signatures that let us know whether the electronics are working correctly."

The science cameras on each rover all performed flawlessly. A spectrometer on each rover for identifying minerals from a distance, called the miniature thermal emission spectrometer, also worked perfectly on each rover.

Two other spectrometers—an alpha particle X-ray spectrometer and a Mössbauer spectrometer—are mounted on an extendable arm for close-up examination of the composition of rocks and soil. Both instruments on Opportunity, as well as Spirit's alpha particle X-ray spectrometer, worked properly. The Mössbauer spectrometer on Spirit is the one whose test data did not fit the pattern expected from normal operation.

"The Mössbauer results we received from Opportunity are helping us interpret the data that we've been analyzing from Spirit," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the suite of science tools on each rover.

News Briefs

Dr. Gerard Holzmann

Holzmann wins software award

DR. GERARD HOLZMANN, principal computer scientist in JPL's new Laboratory for Reliable Software, has won a Thomas Alva Edison patent award in the information technology category.

The award, given by the Research and Development Council of New Jersey, will be presented Nov. 6 at the council's annual awards dinner in New Jersey. Holzmann shares the award, which was for work performed when he was with Lucent Technologies' Bell Labs in New Jersey, with two co-inventors.

Holzmann's invention, called "Method and Apparatus for Testing Event Driven Software," has been used to test the flight software for JPL's Mars Pathfinder and Deep Space 1 missions and will be used on Deep Impact, a spacecraft planned for launch in 2004 that will visit comet Tempel 1 in an effort to understand what is inside a comet.

"It's a wonderful honor to receive this award, and a true privilege to be able to apply these techniques in JPL missions," said Holzmann.

Software team gets NASA honors

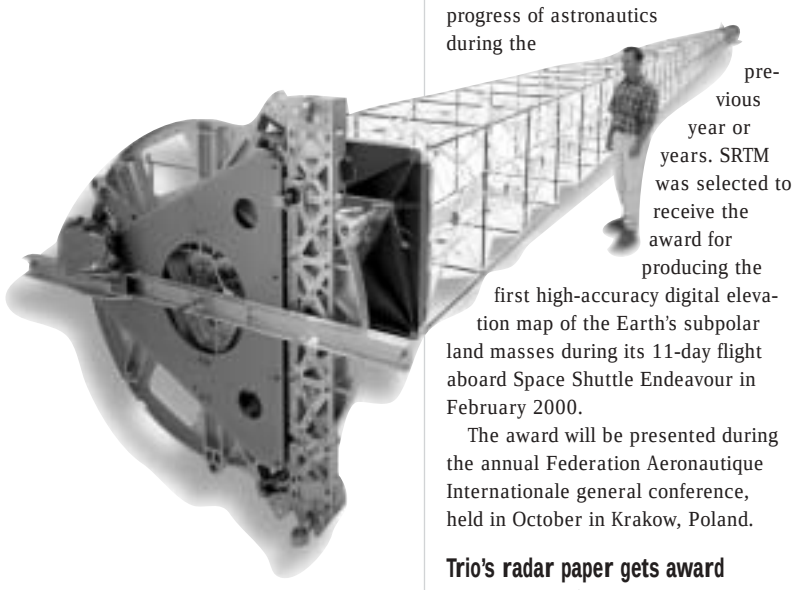
JPL received an award as the best software research organization in NASA at the agency's Code Q Software Assurance Symposium held in Morgantown, WV, July 30–Aug. 1.

The work of DR. ROBYN LUTZ and DR. DAVID GILLIAM was cited at the symposium, which was attended by BRYAN O'CONNOR, NASA Associate Administrator for Safety and Mission Assurance, and software researchers and practitioners from across NASA. DR. MARTIN FEATHER received an award for best research of the year. JOHN POWELL was cited as a major contributor to Gilliam's work and CARMEN MIKULSKI received kudos as a major contributor to Lutz' work.

SRTM receives international award

JPL's Shuttle Radar Topography Mission (SRTM) has been awarded the Honorary Group Diploma for Astronautics by the Federation Aeronautique Internationale.

The organization said the diploma is awarded to groups of people that have contributed significantly to the progress of astronautics during the previous year or years. SRTM was selected to receive the award for producing the first high-accuracy digital elevation map of the Earth's subpolar land masses during its 11-day flight aboard Space Shuttle Endeavour in February 2000.



The award will be presented during the annual Federation Aeronautique Internationale general conference, held in October in Krakow, Poland.

Trio's radar paper gets award

The Institute of Electrical and Electronics Engineers' Geoscience and Remote Sensing Society has awarded its 2003 Transactions Prize paper award to SIMON YUEH, WILLIAM WILSON and STEVE DINARDO for their April 2002 paper "Polarimetric Radar Remote Sensing of Ocean Surface Wind."

The paper described the development of the polarimetric scatterometer radar system (PolScat) and a set of aircraft flight experiments to demonstrate the polarimetric radar measurement concept for ocean winds.

The $2,000 prize and certificates were awarded at the July 24 awards banquet at the IEEE International Geoscience and Remote Sensing Symposium in Toulouse, France.

Barber's liquid propulsion paper wins

TODD BARBER of Research Element 3533 won an award from the American Institute of Aeronautics for a paper on liquid propulsion he submitted to a recent conference.

The paper, "Initial Cassini Propulsion System In-Flight Characterization," co-authored by RICHARD COWLEY, was selected for honors over 160 other papers submitted in the liquid propulsion category. The paper provided an overview of how Cassini's propulsion system has performed during its first four years of flight.

In addition to Cassini, Barber has worked in propulsion mission operations for the Mars Exploration Rovers project and other missions.

Halpern honored by IAA

DAVID HALPERN, senior research scientist in Section 324 and currently on assignment at the White House Office of Science and Technology in Washington, D.C., has been elected a life member of the International Academy of Astronautics for sustained outstanding contributions in basic science related to astronautics, as well as to international cooperation in aerospace sciences.

Halpern is also a Fellow of the American Association for the Advancement of Science, American Geophysical Union and the American Meteorological Society, and an honorary Fellow of the California Academy of Sciences.

Asteroids dedicated to Columbia crew

The final crew of the Space Shuttle Columbia was memorialized in the cosmos as seven asteroids orbiting the sun between Mars and Jupiter were named in their honor on Aug. 6.

The Columbia crew—commander RICK HUSBAND; pilot WILLIAM MCCOOL; mission specialists MICHAEL ANDERSON, KALPANA CHAWLA, DAVID BROWN and LAUREL CLARK; and Israeli payload specialist ILAN RAMON, now have celestial memorials, easily found from Earth.

The names, proposed by JPL, were recently approved by the International Astronomical Union.

The seven asteroids were discovered at the Palomar Observatory near San Diego on the nights of July 19-21, 2001, by former JPL astronomer ELEANOR HELIN, who retired in July 2002. The seven asteroids range in diameter from five to seven kilometers (3.1 to 4.3 miles). The Palomar Observatory is owned and operated by Caltech.

"Asteroids have been around for billions of years and will remain for billions more," said DR. RAYMOND BAMBERY, principal investigator of JPL's Near-Earth Asteroid Tracking System. "I like to think that in the years, decades and millennia ahead people will look to the heavens, locate these seven celestial sentinels and remember the sacrifice made by the Columbia astronauts."

Galileo team event Sept. 21

The Public Services Office is seeking members of the Galileo project for a special JPL event Sept. 21.

Galileo executed 34 orbits of Jupiter following its Dec. 7, 1995, arrival at the planet, in addition to dozens of close examinations of Jupiter's four largest moons. At the end of its 35th orbit, on Sept. 21, it will do a mission-ending dive into Jupiter.

Public Services will host an end-of-mission tribute that will include guest speakers and a general gathering for guests. Galileo veterans are asked to e-mail *pso@jpl.nasa.gov* and include their name, address and telephone number. Those without access to e-mail can call Public Services at (818) 354-0112.

Temporary Lab access for kids

Have you ever left work only to realize that you've left something important back in your office? You've already picked up your child, who is now strapped into the car seat next to you. What do you do?

Well, you don't need to leave your child at the guard gate while you run back into your office. A recent policy revision allows you temporary vehicle access onto Lab, while accompanied by a minor child. For further details, refer to JPL DocID43833, Section 2.1 on JPL Rules!

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meetings are available. Call the Employee Assistance Program at ext. 4-3680 for time and location.

Caregivers Support Group—Meets the first Thursday of the month at noon in Building 167-111 (The Wellness Place). For more information, call the Employee Assistance Program at ext. 4-3680.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Group—Meets the first Friday and third Thursday of the month at noon in Building 111-117. Call the Employee Assistance Program at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parents Group for Children With Special Needs—Meets the second Thursday of the month at noon in the Wellness Place, Building 167-111.

Working Parents Support Group—Meets the third Thursday of the month at noon in Building 167-111. For more information, call the Employee Assistance Program at ext. 4-3680.

Friday, August 15

Summer Salsa and Tango Party—From 9 p.m. to midnight, Caltech's Avery Dining Hall will host Latin dance music, featuring salsa and Argentine tango (the two Ballroom Dance Club summer classes). All dance backgrounds are welcome. For beginners, there will be a mini-lesson starting at 8:30 p.m. Admission is free, and refreshments will be served.

Tues.–Wed., Aug. 19–20

Investment Advice—TIAA/CREF representatives will be available for one-on-one counseling. For an appointment, visit *www.tiaa-cref.org* or call (877) 209-3140, ext. 2614.

Wednesday, August 20

Investment Advice—Fidelity representatives will be available for one-on-one counseling. For an appointment, call (800) 642-7131.

Fidelity Investment Workshop—Fidelity vice president Roland Jacobson will present an advanced workshop from 2 to 4 p.m. in Building 180-101. Topics: economic and market overview, advanced asset allocation and historical mutual fund performance. Seating will be limited, so arrive early.

Thursday, August 21

TIAA/CREF Enrollment Meeting—This workshop, held at noon in T1720-137, is designed to assist employees newly eligible for the Caltech/JPL retirement plan with selection of investment options and completion of enrollment forms.

Thu.–Fri., August 21–22

Von Kármán Lecture Series—Mars Exploration Rovers Project Manager Peter Theisinger will discuss the twin robotic geologists at 7 p.m. Thursday in von Kármán Auditorium and Friday in Pasadena City College's Vosloh Forum, 1570 E. Colorado Blvd. Thursday's lecture will be webcast at *http://www. jpl.nasa.gov/events/lectures/aug03.html.*

Monday, August 25

MLK Quilt Deadline—Entries are due today for the quilting project for JPL's Martin Luther King Jr. 2004 celebration. Designs should illustrate King's spirit and the 2004 theme, "Personal Responsibility in a Diverse World: Share in the Experience of Pride and Equality." Submissions should be on a 6" x 6" sheet of white paper and sent to Laura White, mail stop 201-203. For more information, call her at ext. 3-5441.

Tuesday, August 26

JPL Hiking + Club—Venezuela's oldest national park will be highlighted at a noon slide show presented by guest speaker Tom Ryan, a field biologist, in Building 238-543.

Tues.–Thu., Aug. 26–28

CMMI course—JPL's Software Quality Improvement Project will offer a three-day course at the Embassy Suites Hotel in Arcadia that provides an introduction to the Capability Maturity Model Integrated. For more information, visit JPL's Education & Training site at *http://hr/et*.

Wednesday, August 27

JPL Toastmasters Club—Meeting at 5 p.m. in the 167 conference room. Call Debbie Llata at ext. 3-3690 for information.

Volunteer Professionals for Medical Advancement—Meeting at 10:30 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

Thursday, August 28

JPL Golf Club—Meeting at noon in Building 306-302.

JPL Stories—Jack Dawson of JPL's Media Relations Office will present "Two Spectacular Examples of High-Speed and Time Lapse Photography from JPL," at 4 p.m. in the Library, Building 111-104. One example he will show is the crashing of a commercial aircraft at Edwards Air Force Base using 100 high-speed film and video cameras, a 20-second event expanded to a screen time of 10 minutes.

Ion engine sets test record

The future is here for spacecraft propulsion and the trouble-free engine performance that every vehicle operator would like, achieved by an ion engine running for a record 30,352 hours at JPL.

The engine is a spare of the Deep Space 1 ion engine used during a successful technology demonstration mission that featured a bonus visit to comet Borrelly. It had a design life of 8,000 hours, but researchers kept it running for almost five years, from Oct. 5, 1998, to June 26, 2003, in a rare opportunity to fully observe its performance and wear at different power levels throughout the test. This information is vital to future missions that will use ion propulsion, as well as to current research efforts to develop improved ion thrusters.

While the engine had not yet reached the end of its life, the decision was made to terminate the test because near-term missions using ion propulsion needed analysis data that required inspection of the different engine components. In particular, the inspection of the thruster's discharge chamber, where xenon gas is ionized, is critical for mission designers of the upcoming Dawn mission. Dawn, part of NASA's Discovery Program, will be launched in 2006 to orbit Vesta and Ceres, two of the largest asteroids in the solar system.

"The chamber was in good condition, " said John Brophy, JPL's project element manager for the Dawn ion propulsion system. "Most of the components showed wear, but nothing that would have caused near-term failure."

IT's future in view

CSMISS conference gathers world's experts

The conference focused on bringing the technology leaders and the mission experts together, as well as bringing information technology to the forefront of space mission projects, including JPL's large role in developing and implementing such technology.

BY SUSAN BRAUNHEIM-KALOGERAKOS

More than 300 technologists from all over the world gathered last month to explore and discuss the key role information technology plays in space mission projects. The International Conference on Space Mission Challenges for Information Technology at the Pasadena Conference Center included keynote speakers, tutorials and panel discussions.

Sponsored by the JPL Center for Space Mission Information and Software Systems (CSMISS), the conference was co-chaired by Sven Grenander and Larry Bergman, with Richard Doyle and David J. Atkinson serving as technical program chairs.

The event was the first forum of its kind. It gathered system designers, engineers, scientists, practitioners and space explorers in an effort to recognize how critical information technology is to space mission success. The conference focused on bringing the technology leaders and the mission experts together, as well as bringing information technology to the forefront of space mission projects, including JPL's large role in developing and implementing such technology.

Visitors enjoy the exhibits at the CSMISS conference.

Software, computing, and information technology in general are playing more central roles on space missions these days. All indications are that this trend will continue.

"The role of space information technology has progressively grown in importance from the early days of space exploration," said Grenander, CSMISS deputy leader. "Today, it would be inconceivable to launch a mission without it."

The conference provided an opportunity for promoting technical interchange on all hardware and software aspects of information technology applications in space missions. It centered on current information technology practices and challenges as well as emerging information technologies with applicability for future space missions.

One of the organizers' goals was to foster a sense of community for space mission information technologists from every discipline, and to bring the space mission development experts and the information technology research communities together.

"The event served to bring together the technologists and their customers, the project folks, to get them to mutually understand the problems each face," said Grenander.

Another goal of the conference was to bring together in one forum cross-cutting themes in information technology that run through all aspects of a space mission lifecycle.

"A conference like this is a perfect place to address such issues and themes because they represent a synthesis of many processes and technologies," said Bergman, manager of the Space Mission Information Systems Technology Office. "You are best able to identify these cross-cutting themes when they are presented collectively."

Included among the attendees were aerospace, defense and other industry representatives from several countries including Japan, Canada, the Netherlands, Australia, South Africa, Denmark, Germany and Sweden.

Among the keynote speakers at the symposium was John Delaney of the University of Washington. He touched on similarities between the challenges for deep-sea exploration and deep-space exploration in his talk, "NEPTUNE: A Regional Network of Interactive Ocean Laboratories at the Scale of a Tectonic Plate: A New Paradigm in the Earth and Ocean Sciences."

"I was particularly struck by the similarities between the challenges for deep-sea exploration and deep-space exploration," said Doyle, CSMISS leader. "In both of these areas, information technologies are emerging as an important and very similar component of the solution on how to keep pushing back the frontier."

Other keynote speakers focused on the challenges and the possibilities of information technology. Greg Bollela from Sun Microsystems Lab, the "father" of the real-time Java specification, discussed difficulties of real-time computing in space and the capabilities of real-time Java. In another keynote address, JPL's Adrian Hooke discussed the Interplanetary Network, the space-based counterpart of the Internet as we know it.

Because one of the goals of the conference was to illustrate cross-cutting themes in the discipline, Grenander said he thought the keynote speakers were well selected to represent many fields in information technology. "The speakers presented a great opportunity for collaborations between people that ordinarily would not be in contact with each other," he said.

Panel discussion sessions focused on the future direction of space information technology and a variety of case studies. The tutorial programs ranged from practical topics to the newest cutting-edge technologies. Exhibits were provided from prominent companies like Sun, Lockheed Martin, SGI and Dynamic Systems.

However, the conference was not all work and no play.

To the delight of those from out of town, attendees enjoyed a fun-filled "night out" at Universal Studios Hollywood, took a stroll down CityWalk and watched a special showing of "The Space Shuttle 3D" at the IMAX Theater.

The guest speaker at the private dinner at Universal's Globe Theater that followed was Robert Picardo, who plays the doctor on the Star Trek Voyager series. His character is an emergency medical hologram.

"As his character is a product of artificial intelligence and virtual environments technologies, he was a perfect choice given the conference theme," Doyle said. "He gave us a very thoughtful and witty speech."

The event is being hailed a great success. It left participants and organizers alike satisfied.

Doyle said the attendees were strongly engaged with the theme of the conference, perhaps more so than at conferences that already have a fairly mature series of meetings behind them. "I believe the attendees left with a sense of momentum for future Space Mission Challenges IT conferences," he said. "They plan to be back."

Atkinson, deputy manager of the Information Technologies and Software Systems Division, agreed. "I was heartened by the fact that there is a very talented international community who not only recognize the challenges ahead, but want to work collaboratively to resolve them," he said.

Several of those in attendance have already expressed interest in the next conference, to be held in 2005. An international standing committee is also being established to help organize the future conferences.

Photos courtesy of Kathy Little and Larry Bergman

Passings

DAVE PRESS, 48, formerly with Section 661 (now 281), the Facilities Service Request area, died April 30 from complications of a brain tumor.

Press joined the Lab in 1992 in the Facilities Division Office/Computer Information Services (660). He left JPL in 1999.

Press is survived by his wife, Nipa.

Retirees

The following JPL employees retired in August:

Andre Caticchio, 38 years, Section 512; Roger Dick, 37 years, Section 366; James Miller, 36 years, Section 312; Edmond Momjian, 29 years, Section 107; Patricia McGuire, 26 years, Section 823; Charles Radics, 26 years; Paula Goodrich, 22 years, Section 361; Philip LaFond, 16 years, Section 217; Thomas Dea, 12 years, Section 349.

Letters

Thank you very much to my friends and coworkers who expressed their support following the death of my mother-in-law, and thanks, too, to JPL for the plant.

Alan Mazer

Classifieds

For Sale

AIR CONDITIONER, Sears Coldspot, very large window unit, 28,000 BTU/hr., $125/obo. 661/299-2490.

BABY FURNITURE, Little Folks, maple furniture set, matching crib, dresser/changing table, 3 drawer dresser and hutch, like new, $750/obo. 831-3998.

BED, antique, called "Trailing Vine," brass and iron, ca. 1885, made by Indiana Iron foundry, recently repainted and brass repolished, would make a terrific child's bed, $1,300/obo. 249-0453 betw. 5-9 or jkbonner@gte.net.

BICYCLE, recumbent, Sun EZ Sport limited, color red/silver, new in unopened box, see www.sunbicycles.com, $1,000/obo. 323/256-0215.

CABINETS, oak, 34" W x 78 H x 19 D, glass etched and beveled, $400/ea. 626/963-5484.

CAMPSITE, Big Sycamore Canyon, Pt. Mugu, near Oxnard, Wed., 8/27 - Sat. (noon) 8/30, 3 nights, $55. 956-1744.

CAMP MEMBERSHIP, Thousand Trails/NA-CO nationwide motor home, $1,500. 626/963-5484.

CAR-ROOF CARRIER SYSTEM, Yakima, for 2 bicycles, 4X double cross towers, 2X 48" round bars, 2 X upright with locking arms, nuts, bolt and instructions, mounts on existing raised side rails, will provide e.pictures upon request, $155. 909/621-9722.

CHAIR for office, leather, black, tilt & swivel, pneumatic height adjust, great shape, $40 cash only. 661/297-0219.

COFFEE MAKER, Braun, 10 cups, white/black, like new, $30/obo. 626/791-6101.

COFFEE TABLE, $50; OFFICE CHAIR, $50. 248-1102.

COMPUTER POWER CONTROL CENTER, 5 power switches + 1 master switch, 5 surge-protected outlets + 2 modem/fax/phone jacks, new, $20; ORGAN, Yamaha 415 electronic w/13 pedals, 3 keyboards, 144 rhythm patterns, $2,000. 790-3899.

CONCERT TICKETS, Bruce Springsteen, Dodger Stadium, 8/17, loge. 626/794-0317.

COUCH, black foam futon-type, turns into a full-size bed, must sell, $75/obo. 626/791-7830.

DESK, office, tan metal, 5' long w/filing drawer. 425-0831.

DESK, solid oak, good cond., paid $800, sell for $300. 802-6612.

DESK, student/computer, with file & cabinet space, exc. cond., $99/obo. 790-5024.

DINING TABLE SETTING, all slate blue, 2 large oval tablecloths, 18 placemats, 18 napkins with rings, good cond., $50. 626/357-8210.

DINING TABLE, exc. cond., light wood, two drop leafs, comes with 2 matching chairs, must sell, $100/obo. 626/791-7830.

DISHWASHER, brand new, never used, Whirlpool Gold, model GU1200XTLS, black on stainless MSRP, $599, sell for $450. http://www.whirlpool.com/cgi-bin/ncommerce3/ExecMacro/product/product_spec.d2w/report?itemsku=GU1200XTLS. 388-4440.

DOG HOUSE, Dogloo XT for small dog (up to 45#), good cond., $40. 626/303-1927.

DOG HOUSE, Dogloo II igloo style, vent in roof, outside dimensions about 36" x 36", for medium-size dog, good cond., about 3 years old, $40/obo. 909/596-4390.

EXERCISE MACHINE, NordicTrack Pro ski-type, exc. cond., $100/obo. 626/449-1473 or 626/221-1155, John.

EXERCISE MACHINE, Body-Solid EXM-1500S, see at www.bodysolid.com, $350. 957-5382.

GOLF SET, left-handed, 9 irons (3-SW), 3 woods (1, 3 & 5), bag, balls, glove, tees and more, buy today, play tomorrow, $199/obo. 805/403-9864, Ed.

GUITAR ACCOMPANIMENT BOOK, Oregon Catholic Press + binder for English hymns, vol. I & II, 2003, barely used, $40. 626/840-0955, leave msg. for Mary.

HEADBOARD, walnut, single, $20; CARD TABLE, folding, Samsonite, & 4 folding chairs, $40; SEWING MACHINE, built in flip top cabinet with chair, $70, DRAFTING STOOL, $10. 790-3543.

HEADBOARDS (2), twin, maple with latticework, $25/ea. 626/284-9664.

HUMIDIFIER, ultrasonic, $20; TOASTER OVEN, $20; POWER SUPPLY, Micro-ATX, $5; CHASSIS & POWER, $8. bjchip@computer.org or 353-5479.

LAWN MOWER, Murray 3.5 hp gas mower, gas weed whacker, both for 50. 952-2192, Tom.

LOFT BED with desk, bookshelves, and mattress, Ikea, like-new condition, over $700 new, matching dresser also available, best offer. 714/524-5367.

MOUNTAIN BIKE, downhill, Sinky Kona Gold, 2001, height 15," disc brakes, exc. cond., barely used, paid over $1,500, sell $700/obo. 848-2214, Karen or Robby.

MOVING SALE: nearly-new furniture in vg condition, all prices are obo; TV/stereo cabinet, large teak, $850; bookcases, 2 Bonde style from Ikea, cherry color, 14 x 86" & 28 x 86", $275; end tables, 2 Indonesian teak with iron details, $130; tables, small bedside, wood with drawer & shelf, $225. 323/664-2672.

MOVING SALE: electric blanket (queen dual control), $30; coffee maker, Krups, $15; Seagate 80 GB drive $50; bookcase, $15; sheets, 2, 4 x 8 Marine grade 3/4" ply, (1/2 price) $35/each; Biostar Micro-ATX, built in sound and graphics, Duron 2G & 256 MB $110; speakers, $6; monitor, Princeton, 15," $20; monitor, Hitachi CM715, 19," $100. bjchip@computer.org or 353-5479.

MOVING SALE: household items, washer, $100; dryer, $100; refrig., $200; china cabinet, $100, 2 3-seat sofas, $100/ea; center oak/gls table, $30; rocker w/ottoman, $50; all must go. 246-7365.

MOVING SALE: chair, black leather, $100/pair; loveseat, $50, entertainment center, $50; cocktail table, 39" octagonal glass, $75; washer, Maytag (a9800) and gas dryer (dg 9800), $300; blower, Echo PB1000, $80; aquarium w/stand, 60 gal., acrylic, $120; fertilizer spreader, $15; speaker stands, Sanus, $60/pair. 246-2319.

OPERA TICKETS, 2 for Nicholas & Alexandra, Sept. 23 and 2 for Madam Butterfly

$31/each ticket, Feb. 18, 2004. 352-3244.

ORIENTAL RUG, about 4 ft. by 6 ft., dark blue with patterns, hardly used, $50. 626/840-0955, leave msg.

PDAs, 2 Handspring Visor Neo, 8 MB, includes docking cradle w/USB cable for connection to desktop and carrying case, both in excellent condition, $50 each. 425-0831, Peter.

PICNIC TABLE with benches, redwood, table is 70" x 32", good condition, but needs paint or stain, $50. 626/445-5214, Bob.

PLAYER PIANO, 1920s, Henderson, Chicago, Gulbrunson Player Mech, $300. 626/797-8562.

PORT REPLICATOR, for IBM Thinkpad, works with T20, T21, A20, A21, or X, R series, like new, $85; CARD SHUFFLER, Johnson, collectible, all-metal construction with the exception of the friction wheels which drive the cards and the carved-wood dowel handles; stands ~6" handle-high, and ~9" by 6," flanges and handle inclusive; $35; DIET TAPES, Jenny Craig, set of 14, $50. 790-3899.

REFRIGERATOR, Kenmore Coldspot with icemaker, 14 cu ft., white, ~3 yrs old, exc. cond., $350/obo. 626/446-2989.

SHOVELS, $2/ea. 626/357-8210.

SOCCER CLEATS, Puma Cellerator GCi FG, brand new, never used, men's size 8, women's size 9.5, photo w/ad at JPL Store and http://www.soccer.com, retail $165 + tax, sell $80. 846-1280, Nancy.

TABLE, glass top, 1/2" thick, 1" beveled edge, 4' by 6' with glass base plus 4 Parsons chairs, taupe color, walnut-colored wood legs, includes removable suedette custom-made chair covers, exc. cond., $350/set. 626/345-9850, Park or June.

TEA SET, pottery, made by Maine artisan, nautical theme, matching lighthouse design on all pieces, incl. tea pot, creamer, sugar, platter, small serving bowl, 2 mugs, 2 Japanese tea cups, never used, $100/set. 249-4316.

TOY WOOD CONSTRUCTION SET, Brio Mech Set 4, 152 pieces plus work board, very good cond., original cost ~$150, sell for $40. 626/303-1927.

TREADMILL, Image 10.6; 2.5 hp, 0-10 mph, 1-12% power incline, cordless pulse sensor, programmable, great condition, $500. 249-9534.

TREES: red banana plant 5' tall, $60/obo; fish tail, 6' tall, $80 obo; fichus, >10' tall, braided, in 30" plastic pot, $250/obo; ceramic bowl, gray, 2' diameter w/planted geraniums, $40/obo. 626/791-6101.

WEDDING GOWN, white duchess silk sheath by Amsale, low back, gorgeous detachable train, fit ~size 2 to 4 American, elbow length white tulle veil, $1,000/for set/obo. 249-4316.

Vehicles / Accessories

'93 ACURA Integra GS Hatchback, good cond. 97K mi. red, 5 sp, a/c, moon roof, new tires, belts, brakes, H20 pump, orig. owner, $4,200. 626/794-9358.

'98 ACURA Integra LS hatchback, vg, 45K, blue, 5 spd., a/c, moon roof, cd, alarm, just had 45K service, dlr. maint., all records, good mpg, orig. owner, $10,500. 626/577-2764.

'90 ACURA Legend LS, loaded, runs exc. 128,000 mi., orig. owner, $3,500. 626/445-4497.

'71 CHEVROLET Nova SS 350, new interior buckets, console, $4,400 or willing to trade for pickup of equal value; '70 HARLEY DAVIDSON FLH, all black & chrome, beautiful bike, outlaw style, needs the right owner, runs sweet, $10,000, or willing to trade for pickup of equal value; both for $14,000. 631-8899, Marty, lv msg.

'75 CENTURY 18" Bowrider Trihull, 85HP Chrysler (just rebuilt) outboard on American trailer with new tires, new top, full cover and other extras, $2,700/obo. 626/449-1473 or 626/221-1155, John.

ELECTRONIC AUTO TEST SET, includes an analog ignition oscilloscope that displays both primary/secondary parade and raster waveforms plus a full function analyzer with timing light all on a chrome rollaway cart, $500. 249-6071.

'92 FORD Mustang LX convertible, 2.3L, 79K miles, white w/red interior, power windows/ locks, cruise, cd player, $3,850/obo. Chris, 626/395-1262, cianci@caltech.edu.

'98 DODGE Durango 4 x 4 SLT, exc. cond, red ext., camel leather int., loaded, seats 8, side steps, grill, privacy glass, tow package, new trans, $11.9K/obo. 949/837-4341.

'92 FORD Aerostar XLT, extended minivan, dark green, 118K mi., runs good, new brakes, new front struts, good tires, rear seats fold down flat for carrying large items or can be removed entirely, $2,500. 626/462-0249.

GREASE/GEAR MANUAL PUMP with 5-gal. container, includes 6 ft of 3/8 high-pressure hose with standard coupler, exc. cond., $40; BRAKE BLEEDER KIT, services most brake systems, 1.5-gal. capacity, includes adapters for Ford and GM plus VW and Honda, exc. cond., sells new for over $400, sell for $115. 249-6071.

'03 HONDA Accord EX, loaded, 8K mi., T.O.P., $295/mo. 626/398-8679.

HONDA nosemask, purchased for '98 Accord coupe, like new, $75/obo. 626/449-1473 or 626/221-1155, John.

'93 INFINITI G20, black with gray interior, loaded, sunroof, 5 spd, always maintained, low miles, must see and drive, $5,250. 909/702-2326.

'84 MAZDA RX-7, runs well, red, gray int., very clean, 5-speed manual transmission, cruise control, radio and cassette deck, sun roof, a/c needs repair, only second owner, all service records available, 232,000 mi., Kelley Blue Book "Private Party Value" $1,150. 562/433-2795.

'99-00 MERCURY, Cougar Razzi, body kit match, painted silver & 18" Velox rims, silver w/polished lip, less then 500 miles on Nitto 555 tires, size: 225/35/18, retailed everything bought for $3,000, will sell everything for $1,500. 626/422-0080, Alicia.

TIRES/RIMS, 4 Goodyear Eagle tires (P285 60R16) mounted on 4 American Racing rims (6-lug), originally $1,600, sell $600. 897-1203 or v.pic@verizon.net.

'95 TOYOTA Celica, silver, automatic, 115,000 miles, 1 owner, no accidents, new tires, new belt, alignment, been perfectly maintained and is in excellent condition, Blue Book value $5,500, sell for $4,500/obo. 626/359-0220.

'94 TOYOTA Landcruiser, 119 K mi., very clean, $12,500. 626/398-8679.

'00 VOLKSWAGEN Jetta VR6, 31K mi., silver, auto, sunroof, stereo, air, all power, exc. cond., $13,800. 366-0008.

'95 VOLVO, 850 GLT wagon, 92,000 miles, exc. cond., $8,900. 248-1102.

Wanted

CONDO, GUESTHOUSE, OR APT., for long-time JPLer & husband, no pets or children, needed Oct. '03-June '04 (during construction of new home). 249-4179.

FLUTE OR C INSTRUMENT PLAYER, to practice with guitar for occasional performance for seniors or church functions. 626/840-0955, leave msg.

PATIO DOOR VERTICAL BLINDS, vinyl, to fit 94" wide x 84" high opening, includes all mounting hardware. 246-2319.

SLOT CARS, old, & model kits, cars, boats, airplanes. 626/919-4357, Ralph.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present, for personal use. 790-8523, Marc Rayman.

VOLLEYBALL PLAYERS, coed, no beginners please, Tuesdays 8 to 10 p.m. at Eagle Rock High School, $4/night. 956-1744, Barbara.

VOLUNTEERS, to perform music for senior entertainment and church fund-raising. 626/840-0955, leave msg.

Free

CLEAN FILL DIRT, 14 cu. yds. avail., haul as little or as much as you like, near Los Robles/Jackson, Pas. 626/791-3103, dtrask6@its.caltech.edu.

SOAKER HOSE, 75 ft (a 50 & a 25) in good condition, in La Verne. 909/593-4046 or vivdavies@earthlink.net.

Lost & Found

FOUND: silver earring, Thursday, Aug. 7, on front seat of the east lot bus. Ext. 4-6668.

For Rent

ALTADENA, rear studio apt., kitchen, bath, living/bd., unfurn, a/c, utils inc., $650. 626/379-5749.

ARCADIA apt., 2 bd., + den, 1 ba., garage, remodeled, washer/dryer in unit, a/c, dishwasher; spacious, walking distance to shops, exc. neighborhood, no pets, water/gardener/trash included, $1,290. 626/576-7333.

HACIENDA HEIGHTS, 2-story house/condo, 3 bd., 3 ba. plus den, 2-car garage, guest parking, beautiful yard, upscale planned community w/neighborhood park, near good school district, prefer non-smoker, no pets, $1,800. 626/356-4615, Charli, or 626/823-1572, Sanne.

LA CRESCENTA, peaceful st., 3+2, family rm., lndry rm., C/A, hardwood flrs, patio, fenced yard., mtn. view, gardener pd., Dunsmore school, no pets, credit ck. req'd., $2,100. 550-1989.

LA CRESCENTA, cozy house on a private setting high above Foothill, 2 bd, 1 ba., pool, very quiet, $1,550, includes gardener and pool service. 952-6007.

MONTROSE home, 2 bd., 1 ba., extra room, 2-car garage, yard, hardwood floors, fireplace, laundry provided, quiet, 4 min. to JPL, close to shopping areas, $1,575. 248-5068.

MONTROSE townhome, 2 large bd., 2 full ba., 2-car garage, gated community, top rated school, near JPL campus, $1,500. 800/205-5009.

N. SAN GABRIEL, for lease, 3 bd. + 1.5 ba., house, 2-car garage, patio, exc. neighborhood, no pets, includes gardener service, $1,700, on approved credit. 626/458-3852.

PASADENA, spacious 2-story condo, 3 bd., 2.5 ba., prestigious community, beaut. inter., bright ktch., prof. landscape, ctrl. air & heat, close to shop., cozy LR w/FP, end unit, frml DR, hdwd. flrs., immac. cond., close to schools, $1,750. 626/396-9024.

PASADENA, unfurnished townhome-style apartment, 2 bd., 1.5 ba., patio, dishwasher, central a/c, new carpet & floors, refrig. & stove, laundry, parking, $1,325 plus utilities. 626/429-3677.

PASADENA, furnished 2 bd., 1.5 ba., apartment with central a/c, laundry, patio, parking, close to Caltech & JPL, great for co-ops or interns, $1,350 plus utilities. 626/429-3677.

PASADENA, spacious 1 bd. luxury apt, stall shower and tub, huge closets, fireplace, tiled entry, large kitchen, lg. windows, light & airy, 6-unit bldg, secur. pkg., front apt. $1,150. 626/449-1155.

SIERRA MADRE townhouse to share with Caltech alumna, 1,000 sq. ft. apt, large patio, 2 bd., 1.5 ba., quiet street, garage parking, washer/dryer, $605 + 1/2 utils. 626/355-4838, Heather.

TUJUNGA, Seven Hills area, room in 3 bd., 2 ba., house, in the mountains, north of the Burbank Studios, quiet neighborhood with great views and hiking trails, month-to-month lease for respectful non-smoking professional, some kitchen and laundry privileges, utilities shared. 425-8550.

Real Estate

MT. WASHINGTON house, next to Glendale/ Pasadena/Eagle Rock/Occidental College, 2,000 sq ft., large custom 3 bd., 2 1/2 ba., 2-car garage, lots of storage, exc. Mt. Washington elementary school, 12 minutes from JPL, canyon views, quiet neighborhood, $429,000. 626/403-0446.

Vacation Rentals

BIG BEAR LAKEFRONT, luxury town home, 2 decks, tennis, pool/spa, beautiful master bd. suite, sleeps 6. 949/786-6548.

GREEN VALLEY LAKE, near Big Bear, furnished cabin, cable tv, 1 bd., 1 ba., large living room, sleeps 6, fully equipped kitch., fenced patio, lake swimming, fishing hiking, $100 night, winter $120. 949/859-2237 or 323/256-1031.

HAWAII, Maui condo, NW coast, ocean front view, 25 ft. fr. surf, 1 bd. w/loft, compl. furn. phone, color TV, VCR, microwave, d/w, pool, priv. lanai, slps 4, laundry fac., Low Season rate $105/nite/2, High Season rate $120/nite/2, $15/nite/add'l person. 949/348-8047, or jackandrandy@cox.net.

MAMMOTH, Snowcreek, 2 bd., 2 ba., +loft, sleeps 6-8, fully equipped kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/view to mtns., Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL discount. 626/798-9222 or 626/794-0455 or valerie@gps.caltech.edu.

OCEANSIDE, condo, fully furn. 2 bd., 2 ba., fireplace, full kitchen, quiet, relaxing, beautiful beachside setting, with BBQ, pool, spa, game room, great ocean view; easy walk to pier and restaurants, sleeps 8, available weekly or monthly. 909/981-7492, Darlene or dfhauge@yahoo.com.

OCEANSIDE, on the sand, charming 1 bd. condo, panoramic view, walk to pier & harbor, pool/spa, game rm., sleeps 4. 949/786-6548.

'01 PACE ARROW 34-foot RV, queen bed, sofa bed and dinette bed, monthly rentals only, $3,000 in advance plus $1,000 security deposit, you pay insurance and gas, JPL employees only, no smoking or pets. tahoemike@earthlink.net, 530/525-7334.

ROSARITO BEACH condo, 2 bd., 2 ba., ocean vw., pool, tennis, short walk to beach on priv. rd., 18-hole golf course 6 mi. away, priv. secure parking. 626/794-3906.

JPL'S ONLINE NEWS SOURCE

Classified ads will be available the day before Universe is published at
http://dailyplanet

View this and previous issues of Universe at
http://universe.jpl.nasa.gov

E-mail us at
universe@jpl.nasa.gov

Universe

Editor
Mark Whalen

Design + Layout
Adriane Jach, Audrey Steffan/ Design Services

Chief Photographer
Bob Brown/Photo Lab

Advertising
Susan Braunheim-Kalogerakos

Universe is published every other Friday by the Office of Communications and Education of the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109.

Notice to Advertisers
Advertising is available for JPL and Caltech employees, contractors and retirees and their families. No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission. Ads must be submitted via e-mail to universe@jpl.nasa.gov *and are due at 2 p.m. on the Monday after publication for the following issue.*

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.